



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/931,079	08/17/2001	Duck Chul Hwang	1567.1018	2871
21171	7590	10/20/2004	EXAMINER	
STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			WILLS, MONIQUE M	
			ART UNIT	PAPER NUMBER
			1746	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/931,079

Applicant(s)

HWANG ET AL.

Examiner

Monique M Wills

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-6,8-11,13-15,17-22,24-28,30-32,34 and 35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-6,8-11,13-15,17-22,24-28,30-32,34 and 35 is/are rejected.
- 7) ☒ Claim(s) 5,19,30 and 34 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Request for Continued Examination

A Request for Continued Examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 5, 2004 has been entered.

Response to Amendment

This Office Action is responsive to the RCE filed August 5, 2004. The following rejections are overcome:

- Claims 1, 4-11, 13-15, 17-22, 24-28, 30-32 & 34-35 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.
- Claims 1, 4-5, 9-11, 14, 15, 17-22 & 24-27 under 35 U.S.C. §102(e) as being anticipated by Geronov et al., U.S. Patent 6,344,293.
- Claims 1, 4, 6, 9-11, 14-15, 17-22, 24-27 & 28, 30-32 & 34-35 under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370.
- Claim 13 under 35 U.S.C. §103(a) as being unpatentable over Geronov et al., U.S. Patent 6,344,293 in view of Semel et al., U.S. Patent 5,298,055.

Art Unit: 1746

- Claim 7 under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Carson U.S. Patent 6,488,721.
- Claim 8 under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Igarashi et al., U.S. Patent 6,573,004.

Claims 1, 4-6, 8-11, 13-15, 17-22, 24-28, 30-32 & 34-35 are newly objected/rejected as follows.

- Claims 5, 19, 30 & 34 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.
- Claims 5, 6, 8, 19, 30 & 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
- Claims 1, 4-5, 9-11, 14, 15, 17-22 & 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Geronov et al., U.S. Patent 6,344,293 in view of Takezawa et al., U.S. Patent 6,733,927.
- Claims 1, 4, 6, 9-11, 14-15, 17-22, 24-28, 30-32 & 34-35 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Carson U.S. Patent 6,488,721.
- Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Geronov et al., U.S. Patent 6,344,293 in view of Takezawa et al., U.S. Patent 6,733,927, as applied to claims 1 & 5 above, and further in view of Semel et al., U.S. Patent 5,298,055.

- Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Carson U.S. Patent 6,488,721 as applied to claim 1 above, and further in view of Igarashi et al., U.S. Patent 6,573,004.

Claim Objections

Claims 5, 19, 30 & 34 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The instant claims broaden respective claims 1, 15, 28 & 34 by necessitating that the binder and/or organic solvent may be selected from additional materials other than isopropyl alcohol (organic solvent) and polyvinyl pyrrolidone (binder). Appropriate corrections are required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 5, 6, 8, 19, 30 & 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 necessitates that the binder is selected from a group of polymer materials however, it is unclear as to whether the selected polymer is employed in addition to or in replace of the polyvinyl pyrrolidone of claim 1.

Claim 5 necessitate that the organic solvent is selected from a group of solvent materials however, it is unclear as to whether the selected solvent is employed in addition to or in replace of the isopropyl alcohol of claim 1.

Claim 6 necessitates a polyvinylidene fluoride binder however; it is unclear as to whether the polyvinylidene fluoride is employed in addition to or in replace of the polyvinyl pyrrolidone binder of claim 1.

Claim 6 necessitates a dimethyl formamide organic solvent however; it is unclear as to whether the dimethyl formamide is employed in addition to or in replace of the isopropyl alcohol organic solvent of claim 1.

Claim 8 necessitates a polyvinylacetate binder however; it is unclear as to whether the polyvinylacetate is employed in addition to or in replace of the polyvinyl pyrrolidone binder of claim 1.

Claim 8 necessitates an acetonitrile organic solvent however; it is unclear as to whether the acetonitrile is employed in addition to or in replace of the isopropyl alcohol organic solvent of claim 1.

Claims 19, 30 & 34 necessitate that the organic solvent is selected from a group of solvent materials however, it is unclear as to whether the selected solvent is employed in addition to or in replace of the isopropyl alcohol of claims 15, 28 & 32 respectively.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4-5, 9-11, 14, 15, 17-22 & 24-27 rejected under 35 U.S.C. 103(a) as being unpatentable over Geronov et al., U.S. Patent 6,344,293 in view of Takezawa et al., U.S. Patent 6,733,927.

With respect to claims 1, 4-5, 15, 24 & 27, Geronov teaches a cathodic material comprising an electroactive polycarbon-sulfide material of $C(S_x)$ (col. 7, lines 35-40) wherein x ranges from 2.5 to 50 (col. 7, lines 40-50), a conductive agent of graphite or conductive carbons (col. 9, lines 1-5), a binder in the amount of 2 to 30% by weight (col. 9, lines 15-20) including polyethylene oxide and polyvinylidene fluoride (col. 9, lines 15-20), and an isopropanol electrolyte solvent (col. 9, lines 45-50). With respect to claims 9 & 18, the cathode material includes an electroactive polycarbon-sulfide material of $C(S_x)$ (col. 7, lines 35-40). With respect to claims 10 & 26, the binder is present in the amount of 2 to 30% by weight (col. 9, lines 15-20). With respect to claim 14, the conductive agent is graphite or conductive carbon (col. 9, lines 1-5). With respect to claim 15, the negative electrode includes lithium metal and lithium alloys (col. 10, lines 15-20). With respect to claims 17 & 25, the binder is polyethylene oxide (col. 9, lines 45-50). With respect to claims 19 & 25, the electrolyte solvent includes 1,3- dioxolane (col. 11, lines 35-40). With respect to claim 20 & 21, the electrolyte comprises a 1.4 M solution of lithium bis (trifluoromethylsulfonyl) imide (Example 1) .

Geronov is silent to a binder comprising polyvinyl pyrrolidone (claims 1, 15, 24 & 27). The reference does not expressly disclose that the organic mixing solvent has a solubility of sulfur equal to or less than 50mM (claims 1,11,15 & 22).

Takezawa teaches the functional equivalence of polyvinylidene fluoride and polyvinyl pyrrolidone as binders for lithium cathodic materials.

Therefore, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the instant invention was made because even though Geronov does not teach polyvinyl pyrrolidone binder material in the positive electrode, Takezawa teaches that polyvinylidene fluoride and polyvinyl pyrrolidone are art recognized equivalent material for use as binders in lithium electrodes, and therefore one having ordinary skill in the art would have substituted one binder material for the other.

With respect to claims 1, 11, 15 & 22, it would be reasonable to expect the electrolyte mixing solvent to have a solubility of sulfur of 1 to 50mM, because Geronov employs the same organic solvents as Applicant. Additionally, "products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. In re Spada, 911 F.2d 705, 709, 15 USPQ 2d 1655, 1658.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 6, 9-11, 14-15, 17-22, 24-27 & 28, 30-32 & 34-35 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Carson U.S. Patent 6,488,721.

With respect to claims 1, 15, 24, 27, 28 & 32, Nakagiri teaches a positive electrode comprising: Li_2S_2 , Li_2S_4 , Li_2S_6 , Li_2S_8 , Li_2S_{12} active material (col. 6, lines 35-40): a conductive agent such as carbon powder, carbon fibers, graphite, acetylene black and graphite fibers (col. 8, lines 1-5); an organic polymer binder such as polyvinyl pyrrolidone or polyvinylidene fluoride (col. 7, lines 60-68); and an organic mixing solvent where solubility of sulfur is equal to or less than 50mM, such as tetrahydrofuran, N,N-dimethylformamide and N-R-2-pyrrolidone (col. 3, lines 35-40). Additionally, the positive electrode may include acetonitrile (example 1), dimethylformamide (col. 3, lines 35-40) and a polyethylene oxide binder (col. 7, lines 50-60). With respect to claims 28, & 32, the method of making the positive electrode includes: dissolving polyvinylidene fluoride in polypropylene carbonate (col. 7, lines 55-65): mixing a conductive agent and homogeneous dispersion of the cathodic material (col. 9, lines 5- 10 & Example 1) to make a slurry; coating the slurry on a current collector and drying the coated current collector. See column 8, lines 15-60 and Example 1. With respect to claims 4, 17 & 25, the binder may include polyethylene oxide (col.

Art Unit: 1746

7, lines 55-60). With respect to claims 6, 30, 31, 34 & 35, the binder is polyvinyl pyrrolidone (col. 7, lines 55-60) and the mixing solvent is dimethyl formamide (col. 8, lines 15-20).

With respect to claims 9 & 18, the cathode material is Li_2S_2 , Li_2S_4 , Li_2S_6 , Li_2S_8 or Li_2S_{12} (col. 6, lines 35-40). With respect to claim 14, the conductive agent is carbon powder, carbon fibers, graphite, acetylene black or graphite fibers (col. 8, lines 1-5). With respect to claims 15, 19 & 20, the negative electrode is lithium metal or a carbonaceous material (col. 12, lines 20-25) and the electrolyte comprises a lithium salt such as LiClO_4 , LiCF_3SO_3 and/or $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ (col. 7, lines 50-60) and a non-aqueous solvent such as propylene carbonate (col. 7, lines 50-60). With respect to claim 21, the electrolyte concentration is 0.5 to 2.0 M lithium salt (col. 13, lines 10-15). The reference exemplifies the use of about 3-wt% binder in the cathode (See Examples 1-6).

Nakagiri is silent to: dissolving the binder in isopropyl alcohol (claims 1, 15, 24, 27, 28 & 32); employing at least five percent by weight of the binder (claims 1, 10, 15, 24, 26, 27, 28, 32) or the electrolyte organic mixing solvent having a solubility of sulfur of 1 to 50mM (claims 1, 11, 22, & 28).

Carson teaches that it is well known in the art to employ isopropyl alcohol in cathodic mixtures, in order to increase dispersion ability of the cathodic material (col. 26, lines 55-58 & col. 27, lines 1-8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to employ the isopropyl alcohol of Carson in the cathodic material of Nakagiri, in order to increase dispersion ability of the cathodic material.

With respect to employing at least five percent by weight of the binder (claims 1, 10, 15, 24, 26, 27, 28, & 32), it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to employ at least 5 wt% binder in the cathodic material,

since it has been held that discovering optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The skilled artisan recognizes that the amount of binder directly effects the structural integrity of the electrode.

With respect to claims 1, 11, 22 & 28, it would be reasonable to expect the electrolyte mixing solvent to have a solubility of sulfur of 1 to 50mM, because Nakagiri in view of Carson employs the same organic solvents as Applicant. Additionally, "products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. In re Spada, 911 F.2d 705, 709, 15 USPQ 2d 1655, 1658.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Geronov et al., U.S. Patent 6,344,293 in view of Takezawa et al., U.S. Patent 6,733,927, as applied to claims 1 & 5 above, and further in view of Semel et al., U.S. Patent 5,298,055.

Geronov in view of Takezawa teach a positive electrode as described hereinabove. More specifically, Genorov teaches a cathodic material comprising 2 to 30% of a binder blend

including polyethylene oxide. The reference is also concerned with manipulating the dilution of the electrolyte in order to control the ion conductivity between the electrodes (col. 3, lines 30-55).

Geronov does not expressly disclose a mixing ratio between the binder an oxide polymer of 1 to 9:9 to 1 in weight ratio.

Semel teaches that it is conventional to employ polymer blends including 30% propylene oxide and 40% of a fluorelastomer to increase the dusting resistance of the positive electrode (Table 4.1 and 4.2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to employ the mixing ratio of Semel in the binder blend of Geronov in view of Takezawa, in order to increase the dusting resistance of the positive electrode.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Carson U.S. Patent 6,488,721 as applied to claim 1 above, and further in view of Igarashi et al., U.S. Patent 6,573,004.

Nakagiri in view of Carson teach a positive electrode as described hereinabove, including the employment an isopropanol mixing solvent.

Nakagiri is silent to mixing the solvent with polyvinylacetate in the cathodic mixture.

Igarashi teaches that it is conventional to employ polyvinylacetate in cathodic mixtures in order to minimize reduction in capacity at repeated charge-discharge cycles (col. 3, lines 5-35 & col. 5, lines 10-45).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to employ polyvinylacetate of Igarashi in the cathodic mixture of Nakagiri in order to minimize reduction in capacity at repeated charge-discharge cycles.

Response to Arguments

Applicant's arguments, see page 10, filed August 11, 2004, with respect to the rejection of claims 1, 4-11, 13-15, 17-22, 24-28, 30-32 & 34-35 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement have been fully considered and are persuasive. The §112 first paragraph rejection has been withdrawn.

Applicant's arguments with respect to claims 1, 4-5, 9-11, 14, 15, 17-22 & 24-27 being rejected under 35 U.S.C. §102(e) as anticipated by Geronov et al., U.S. Patent 6,344,293 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments with respect to claims 1, 4, 6, 9-11, 14-15, 17-22, 24-27 & 28, 30-32 & 34-35 being rejected under 35 U.S.C. §103(a) as unpatentable over Nakagiri et al., U.S. Patent 6,576,370 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments with respect to claim 13 as being rejected under 35 U.S.C. §103(a) as unpatentable over Geronov et al., U.S. Patent 6,344,293 in view of Semel et al., U.S. Patent 5,298,055 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments with respect to claim 7 as being rejected under 35 U.S.C. §103(a) as unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Carson U.S. Patent 6,488,721 have been considered but are moot, because the claim has been cancelled.

Applicant's arguments with respect to claim 8 as being rejected under 35 U.S.C. §103(a) as unpatentable over Nakagiri et al., U.S. Patent 6,576,370 in view of Igarashi et al., U.S. Patent 6,573,004 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Monique Wills whose telephone number is (571) 272-1309. The Examiner can normally be reached on Monday-Friday from 8:30am to 5:00 pm.


If attempts to reach Examiner by telephone are unsuccessful, the Examiner's supervisor, Michael Barr, may be reached at 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MW

10/16/04


FRANKIE L. STINSON
PRIMARY EXAMINER
GROUP 3400 1700